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Impact of financial sector development on economic growth
Evidence from Rwanda

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Abbreviations, Acronyms and Explanations

BACAR :	Banque Continentale Africaine au Rwanda
BANCOR :	Banque à la Confiance d'Or
BCDI :	Banque de Commerce, de Développement et de l'Industrie (ECOBANK)
BCR :	Banque Commerciale du Rwanda (I&M Bank)
BHR :	Banque de l'Habitat du Rwanda
BK :	Bank of Kigali
BNR :	National Bank of Rwanda
BPR :	Banque Populaire du Rwanda
BRD :	Banque Rwandaise du Développement
CBHI :	Community Based Health Insurance
CHR :	Caisse Hypothécaire du Rwanda
CMA :	Capital Market Authority
CMAC :	Capital Market Advisory Council
COOPECs :	Savings and Credit Cooperatives
COGEBANQUE :	Compagnie Générale des Banques
CRB :	Credit Reference Bureau
CSR :	Caisse Sociale du Rwanda
DTIs :	Deposit taking financial institutions
F-ADF :	Augmented Dickey-Fuller unit root test
FSC :	Financial Stability Committee
GDP :	Gross domestic product
GLM :	Generalized linear model
GMM :	Generalized method of moments
KCB :	Kenya Commercial bank
KRR :	Key Repo Rate
LIC :	Low income countries
MFIs	Microfinance institutions
MMI :	Military Medical Insurance
NBFIs :	Non-banking financial institutions
NBR or **BNR** :	National Bank of Rwanda
NDIs :	Non-depository financial institutions
OLS :	Ordinary Least Square
PP :	Philips-Perron test
RAMA :	Rwandaise d'Assurance Maladie
RSE :	Rwanda Stock Exchange
RSSB :	Rwanda Social Security Board
RWF :	Rwandan Franc
SONARWA :	Société Nationale d'Assurance du Rwanda
SORAS :	Société Rwandaise d'Assurances
SVAR :	Structural Vector Autoregressive
UBPR :	Union des Banques Populaires du Rwanda
VAR :	Vector Autoregressive
VECM :	Vector error correction model

Introduction

Financial sector plays an important role in economics growth by mobilizing funds and providing credits. Progressively, attention has emerged in the field of economic development thanks to its ability to increase productivity and capital efficiency. According to some economists, countries having a well-developed financial sector tend to grow faster. Some others claim that finance doesn't favors growth, rather serves to respond to a demand coming from the real sector. This idea was broadly shared by Robert Lucas, Nobel laureate in 1995, who considered that finance was not the core determinant of economic growth.

Since years, an additional interest focused on developing countries has been explored to determine factors allowing a long-term economic growth. Endogenous growth theories identified factors to stimulate long-term growth rates in African countries. And studies have demonstrated that the best way to achieve a yearly growth around 4-5% was to improve the development of the financial sector (World Bank, 1989). A significant link among the financial sector and the economic growth has been observed in these countries. To support this theory, various researches have been devoted to explain and demonstrate the importance of the financial development on economic growth. However, the causality between the financial development and the economic growth remains still unclear. Thereby, does the positive impact of the financial development comes from a higher growth or the reverse? In some ways, does the financial development favors economic growth, or the other way round? Does the economic growth provides a higher demand for capital and financial services, helping to develop the financial sector? A wide literature explains the role of the financial development in economic growth, but the reverse link, explaining how the economic growth impacts financial development was slightly browse. Whatever direction dominates, a close relationship exists among both variables.

Analyze the link among financial sector and economic development appears relevant in the case of Rwanda, considered as one of the best example in African countries. Macroeconomic reforms placed the country in a good position to make business inside international ranking. With a favorable economic growth, inflation under control, foreign investments in constant rising and a financial sector promoting business, Rwanda is cited as a model. The development of its financial sector has improved access to credit and has increased businesses creation. This has strengthened entrepreneurship and the fight against corruption. The economic and political reforms have rapidly contributed to improve the living conditions. Although, progresses are still needed. Considerable improvements has been observed in health, in education and in poverty reduction, especially these last fifteen years.

Based on recent data, the objective of this project is to analyze the roots through which financial development has supported economic growth.

The project contains five chapters. The first section presents some definitions and presents the general framework about the benefits on finance and some links with growth. The first chapter focuses on the literature review and presents factors promoting growth. In addition, empirical researches based on general case studies will support this theoretical part. The second chapter presents the main characteristics and indicators of the Rwandan economic situation. The third chapter exhibits the structure of the financial market throughout its components and his recent development. The next chapter assesses the financial sector development based on four dimension matrix: depth, access, efficiency and stability. In addition, a comparable analysis with low income countries, to observe national improvements, was done. Last chapter, devoted to empirical analysis examines the relationship between financial development and economic growth in Rwanda. Using annual data going from 1995 to 2016, two linear regressions will be presented with the OLS model. Finally, a general conclusion summarizes our findings.

Theoretical introduction

The first section starts by giving some definitions, then provides a theoretical framework about the benefits of the financial sector and his linkages with the economic growth.

1. Definitions

1.1. Financial sector

The financial sector includes all the wholesale, retail, formal and informal institutions that provide financial services to consumers, companies, governments and other institutions. The sector gathers activities from banks, stocks exchanges, insurers, credit unions, microfinance institutions and money lenders.

The fundamental role of finance is to provide credit to economic agents. Meaning differently, its aim is to channel the excess of funds, having a surplus, to deficit units allowing to generate a higher income growth and to provide liquidity services. Apart allocating capital, the financial sector helps to monitor investments but also to facilitate the trade of goods and services, diversify and manage risk, and mobilize and pool savings (*see point 2.1."Benefits of finance in developing countries"*).

1.2. Financial development

The financial system includes institutions, instruments and markets as well as legal and regulatory framework that allows capital flows to facilitate economic activity (Rana et. Barua, 2015). Financial development is defined as the improvement in quantity, quality and efficiency on financial intermediary services (Choong et. Chan, 2011).

To measure the financial development, four instruments are used: depth, access, efficiency and stability. Financial depth determines the size of the sector, in particular the degree of banks and financial markets activities. Financial access reflects the ease with which economic agents can access to financial services. Financial efficiency measures the cost of intermediation credit. Finally, financial stability defines the extent to which the system absorbs economic shocks or unforeseeable events.

1.3. Economic growth

Economic growth is the core indicator used to monitor annual change of a given country. The gross domestic product is the worldwide measure of the aggregate production. It includes the wealth, all goods and services produced by a country in a year, whether sold domestically or abroad, or the sum of value added. This evolution over the period resulted from a series of government policies and decisions on investment, spending, consumption, production, trade, but also past decisions.

2. Economic theory

2.1. Benefits of finance in developing countries[1]

The financial sector fulfill an important role in economic development and growth. The main objective is to gather money and to provide funds to people, companies and public institutions.

Major benefits of finance are the following:

- Credit and capital provision – provide credit (resources) to support economic activity and invest in infrastructure project, e.g. schools, roads, hospitals, … ;
- Liquidity provision – institutions such as banks provides protection to businesses and individuals against sudden cash needs ;
- Manage risk – by pooling risks, finance offers better risk management against financial market and commodity price risks ;
- Help to save money ;
- Support domestic and international trade by facilitating transactions ;
- Support jobs creation such as entrepreneurs and provide new employment opportunities (microcredit);

[1] Also valid for developed economies

- Bring higher stability and prevent from unexpected shocks.

The economic theory shows evidence of financial development on poverty (take out of extreme poverty), both indirectly, through its positive impact on growth and directly, through the extension of services. Diversification of traditional financial institutions into postal banks, development banks, credit unions, or even microfinance institutions, has further expanded the services offered and has allow to catch less bankable population, enabling them takes part of the financial process.

2.2. Linkages among financial development and economic growth

The economic literature describes three types of relationship between financial development and economic growth. The supply-leading theory argues that financial development leads to economic growth. As observed by Bagehot (1873), financial system has played a key role during the industrialization in England by facilitating the mobilization of capital. Schumpeter (1911) has also pointed the importance of the banking system in the economic growth. He suggested that intermediaries like bankers connect agents who need funds with those who want invest, in that way, they contribute to promote innovation and spur economic growth. But it also, contribute to allocate resources from unproductive sector to productive one. So, banking activity stimulates economic development. However, their great importance is mostly observable during innovation stages, otherwise, finance plays a complementary role having, sometimes, an "over-stressed" impact on growth. He mentioned that financial institutions favor innovation and growth by detecting and financing productive investments decisions. While, some as Keynes (1936), Gregorio & Guidotti (1995) or Andersen & Tarp (2003) defend the opposite idea, a negative effect or no link at all. One of the coherent explanation is a bad allocation of funds focused on non-productive activities due to microeconomic inefficiencies in the banking sector. Finally, some as McKinnon (1973) and Shaw (1973) emphasize the importance of the financial sector to mobilize savings and accumulate capital, compulsory to economic growth.

The demand-following response hypothesis, shared by Robinson (1952), stipulates that when the economy observes a surge, private businesses upward their investment plan which automatically increases the demand of financial services. In some words, the relationship goes from growth to finance. This theory stipulates that a higher firm performance requires an additional financial capital to expand. More, private investors borrow more from financial intermediaries to make their investments. In that case, financial development only follows the economic growth.

The third hypothesis, sustains a simultaneous causal relationship between both variables. Though, according to Patrick (1966) this causal relationship is not static and depends on the stage of a country development. During early economic growth, the demand following response dominates the supply leading response because of the need of real impulse from the financial sector to provide funds for innovation and investment. Later, once the economy reached a self-sustainability, investors benefitting from existing opportunities ask additional borrowings to invest in new projects. This assumption reveals some complementarities among both variables. Nevertheless, this sequential process is not transmissible across industries or sectors.

Chapter 1: Literature review

This chapter presents some empirical works. The first section reviews the literature while the second focuses on research conducted in Rwanda. The third section highlights similarities and divergences across countries to better understand the factors that contribute the most to economic growth.

1. Empirical literature review

Empirical studies support the three hypothesis. Demetriades and Hussein (1996) led tests between financial development and real GDP. They found little evidence that finance was the core element of economic development. However, the authors observed clear evidence of bi-directionality and reverse causality. Finally, their findings have demonstrated that causality patterns may vary across countries, this implies not to consider all countries as homogeneous entities.

Liu et al. (2006) studied linkages between financial development and growth in three Asian countries, Taiwan, Korea and Japan, from 1981 to 2001. The objective was to highlight the role of financial development and better organize monetary and financial policies in the growth process. Using GMM, results demonstrated that high investment rate has favored economic growth, only in Japan. In case of Korea and Taiwan, findings mentioned that to observe similar results investments should be allocated more efficiently. The finance-aggregate had a positive effect inside Taiwan's economy, however, a negative impact was observed in other countries. Finally, the stock market development has provided positive effects on Taiwan's economic growth allowing him to suffer less from the Asian financial crisis.

Saqib (2013) evaluated empirically the impact of development and efficiency of financial sector on economic growth, from 2005 to 2009, on a sample of 50 developing countries. Data included GDP per capita, gross fixed capital formation, while broad money, private credit, deposit and lending rates, described the financial sector. All results were highly significant. Indeed, the model argued that financial sector development and efficiency are crucial to promote economic growth. Thereby, financial sector development should take part of the government strategy to achieve a sustainable economic growth in the long term. In addition, several ideas has also been highlighted, such as the liberalization of the financial system, the adoption of international codes and standards, the strengthening of the prudential regulation, the supervision and the adequate staff training.

Zogjani and Mazelliu (2015) focused on the case of Kosovo. The paper analyzed the impact of financial sector on economic growth, between 2008 and 2014. The analysis included an OLS linear regression and a correlation matrix. Once again, economic growth was used as a dependent variable while the financial sector, inflation and exchange rate were used as independent variables. The model found a positive impact and a positive correlation between financial sector and economic growth. The inflation rate had a positive and significant impact on economic growth. While, the exchange rate had a negative but not significant impact on economic growth. This research has put into evidence the crucial role played by the financial sector in the Kosovo economy. In fact, included FDI and remittances, the sector contributed to 60% of the GDP.

The paper wrote by Mandiefe (2015) made a distinction between short and long-run impact of the financial sector development on economic growth. The study compared two country, Cameroon which aspires to emergence by 2035 and South Africa, already emergent. Data from 1980 to 2010 included variables as real GDP, the ratio of money (M2), the credit to the private sector and bank deposits. Using VECM, major observations confirmed a long-run relationship between economic growth and financial development observed in Cameroon. While, South Africa experienced two movements. First, a short-run link among bank deposits and economic growth, then a long-run relationship between economic growth and financial development. This comparison allows to observe that a well-developed financial sector comeback faster to his long-run equilibrium, in case of a shock, than a less-developed one.

Venâncio (2013) analyzed the link between financial development and economic growth inside 2 samples of developed countries, one included 17 countries from 1980 to 2011, other 19, from 2000 to 2011. The first panel of countries included domestic credit provided by the banking sector, domestic credit to private sector, gross domestic savings and central government. The second panel added variables such as claims on the other sector of domestic economy, money and quasi money growth (M2), bank non-performing loans, bank liquid reserves

to bank assets and stock traded. Both regressions included two control variables, inflation rate and government final consumption expenditures. Major findings indicated that domestic credit provided by banking sector and domestic credit to private sector was negatively correlated with growth. Thus, a poor and inefficient credit allocation revealed some deficiencies. Comparable to Ayadi et al. (2013), the relevant element to achieve economic growth was not the volume of the banking system, rather the quality and the performance of their activities. In addition, the gross domestic savings and M2 played a significant role in economic growth. And, the ratio of non-performing loans to total loans was positively correlated with GDP. Non-performing loans were influenced by credit variables and macroeconomic shocks. But once excluded, these variables became negatively correlated with the economic growth. Financial development promoted economic growth in countries having higher assets quality, little credit risk and efficient allocation of resources. Surprisingly, little evidence was observed between liquidity provided by the banking system and capital markets, and economic development.

Ang (2008) focused on Malaysia. He highlighted linkages among financial development and economic growth, from 1960 to 2003. Thus, financial development brought higher output growth thanks to private savings and private investments. The study supported endogenous financial development hypothesis and growth theory, in favor of a more efficient investment necessary to achieve a stronger growth. Evidence shown that policies towards interest rate controls, high reserve requirements and direct credit programs positively influenced the financial development. However, some direct governmental interventions, such as public investment programs can have a negative impact on development.

Based on Granger causality model, Odhiambo (2008) analyzed the causal link between financial depth and economic growth in Kenya using annual time series data from 1968 to 2008. His research has been inspired by the current debate, in developing countries, about inter-temporal causal relationship, which questioned on the finance-led growth response or the growth-led finance response. The empirical results revealed that the causality depends on the measure used. But, mainly the predominance tends in favor of demand following response. Thus, arguments in favor of the finance leading growth must be taken with caution.

Authors as Kindleberger (1978) and Minsky (1991) support the negative impact on financial instability on economic growth. According to Kindleberger, a loss of confidence and trust towards institutions can decrease investments and induce a wave of disintermediation or closure. More, institutional instability can increase the cost of transactions and harm the payment system. Higher transaction costs may imply misallocation of resources and hence limit economic growth. On the contrary, a sound financial system can help to maintain confidence among savers and investors to better mobilize resources and increase the productivity. The financial instability hypothesis established by Minsky, revealed that economic growth can encourage a risky and speculative behavior. Which can foster a crisis due to loan default caused by higher costs.

Eichengreen and Arteta (2000) focused on causes of the banking crises inside emerging markets, considered as detrimental to economic growth. The analysis was limited to 75 emerging market economies, from 1975 to 1999, where banks held a significant share of total assets. Variables included imports, external debt, current account, government budget surplus, real exchange rate, ratio of M2, domestic credit growth and some others. Major results showed that rapid domestic credit growth, large bank liabilities and deposit rate decontrol have been the key determinants of the banking crisis. Observations suggested that bank stability can be threatened when macroeconomic and financial policies, combined with financial deregulation, generate an unsustainable leading boom. Thus, a rapid increase of loans can result in lower quality. The liberalization of domestic interest rate can strengthen the competition, provide unsustainable lending and encourage risky activities. Finally, few evidence was found between the exchange rate regime and the banking crises.

2. Empirical facts on Rwanda

In Rwanda, financial development results essentially from the financial repression theory. According it, efficient use of resources through highly organized, developed and liberal financial system, provides economic growth (McKinnon (1973) and Shaw (1973). Additional works have progressively extended this hypothesis (Kigabo, Okello and Mutuyimana, 2015). And all support the supply leading theory of financial growth. However, studies based on the banking sector revealed that there is not a single measure of development. In fact, as presented

earlier, banking sector development includes various steps, going through quantity, quality and efficiency improvement of financial services.

The study presented by Okello et al. (2015) analyzed the causality between financial development and economic growth during the flourishing economic performance. It consisted to observe whether the banking development has influenced economic growth (supply flowing hypothesis) or the reverse (demand flowing hypothesis). Using VAR and VECM models authors examined the causality direction. Quarterly data, going from 2000 to 2015, were used and variables included bank deposits, credit to private sector, money supply (M3), while GDP per capita was used as dependent variable. All data were significant and have found at least two long-run equilibrium relationships. Thus, a linkage among banking development and economic performance was observed. Broad money had a negative and significant effect on GDP per capita. While, credit to private sector and bank deposits have positively and significantly impacted the GDP per capita. Nevertheless, data indicated that policy makers should not resort, in the short-run, on money supply to stimulate economic growth. These findings widely supports the supply flowing hypothesis.

Second example illustrated by Gisanabagabo and Ngalawa (2017) analyzed the relationship between financial intermediation and economic growth. As previously, the study attempted to investigate empirically the possible cointegration and causal link among both variables, using quarterly data from 1996 to 2010. A SVAR model was used to investigate the short-run dynamics. Five variables have been selected, such as potential liquidity available, real interest rates, domestic credit to the private sector, gross fixed capital formation and finally the rate of economic growth. Evidence shown that domestic private sector credit shocks contributed for the largest proportion to fluctuations in real output, while the shock of potential liquidity held the second place. Once again, the supply-leading hypothesis occurred. Findings revealed that to attract businesses, by allowing an easier use of financial services, could contribute to achieve a significant economic growth.

Third study presented by Cyuzuzo (2018), focused on factors influencing the development of capital markets, considered as an important factor for economic and financial growth. According to, Yartey and Adjasi (2007), stock markets provide additional opportunities for growing companies to rise their capital at lower costs. More, companies located next to developed stock markets might be less dependent on banks. So, analyzing how macroeconomic variables can affect the growth and the development of the stock exchange remains interesting. It also gives an overview on how recent implementation of the Rwanda Stock Exchange has contributed to economic growth. Quarterly data, from 2011 to 2016 have been used for both GLM models. Selected variables included GDP, key repo rate[2], inflation rate and money supply, while consumption was used as control variable. The second model included market capitalization, both capital formation and consumption were used as control variables. Results provided that only money supply had a significant relationship with market capitalization. A positive and statistically significant link was also observed among market capitalization and GDP. A similar relationship appeared between capital formation and economic growth. All provided the same conclusion about the regional integration. In short, regional integration provides access to RSE to new participants which can boost its performance, having, in same time, an efficient impact on economic growth. Thus, a positive impact of money supply on RSE performance could provide a good incentive for the Central Bank to further resort to this instrument. Finally, Government should further develop the capital market by issuing shares from private companies to diversify the number of available products.

Finally, paper wrote by Rurangwa and Shukla (2017) analyzed the bi-direction between capital market development and economic growth. Quarterly data going from 2009 to 2016 were analyzed with an OLS method. The model contained GDP as dependent variable, while market capitalization, turnover and volume of shares traded were used as independent variables. Results provided that all independent variables have positively contributed to economic growth. More, findings shown a positive long-run relationship between capital market development and economic growth. Despite his low market size, the turnover and the volume of shares traded have influenced and stimulated the Rwandan development process. To that, some recommendations have been highlighted, the major of them included the use of automated trading and settlement practices in electronic fund to eliminate physical transfer of shares, continue to educate local investors to boost the development of capital market, increase the number of investment advisors able to analyze complex financial concepts, such as options

[2] Key repo (KR) is the rate at which the commercial banks borrow from the Central Bank.

or derivatives investment and finally, increase the number of listed companies to ensure stable macroeconomic environment, encourage foreign multinational companies or subsidiaries to join the RSE.

3. Similarities and divergences: factors promoting growth

Major researches highlight various impacts of financial sector on economic growth process. Their importance and expected effects mostly depend on the country development stage and individual characteristics, however some results are common to most.

A link exists among financial sector development and economic growth in all studies presented above. Especially, as observed by Cyuzuzo (2018) and Saqib (2013), gross fixed capital formation and private saving, Ang (2008) have a positive impact on economic growth. Inflation and high reserve requirements also show a positive impact. However, generally, this kind of studies provide evidence on a controlled inflation. Positive impact of finance on growth leads by the stock market development, private savings and investments also exists. As observed, the exchange rate do not impact economic growth. While, bank deposits provide an effect but solely in the short-run.

Some variables, such as credit and broad money, present divergent views. In fact, some studies highlight a negative impact of credit and a positive impact of broad money on growth, as illustrated by Venâncio (2013). Similarly, Eichengreen and Arteta (2000) share the idea of a negative role of the domestic credit growth and broad money in the banking crisis. Gisanabagabo and Ngalawa (2017) support the impact of credit on real output fluctuations. As, a weak and a bad credit allocation may be deficient. In addition, a lack of adequate infrastructure can hamper economic growth and make the economy more volatile, especially in the early stages of development. On the contrary, according to Okello (2015), broad money has a negative impact on growth, while credit has a positive impact on growth.

Chapter 2: An overview of the Rwandan economy

Rwanda is a small landlocked country located in Central and East Africa. Situated a few from Equator, Rwanda is bordered by Burundi, Uganda, Tanzania and Democratic Republic of Congo. Its geography is dominated by mountains, in the west and savanna, in the east. Its climate is temperate to subtropical with two rainy and two dry seasons each year. Kigali, the capital of Rwanda, is located in the center. In 2017, the population was 12.2 million[3], mostly young and predominantly rural. With 445 inhabitants per square kilometer, the country density is considered as one of the largest in the continent.

With a GDP per capita equivalent to $765[4] in 2017, the country takes part of the low-income economies[5]. As illustrated below, Rwanda display a flourishing economic expansion. Its GDP indicates a positive and sustainable trend around 7.6% of annual growth rate since 2003 (Vision 2020[6] targeted around 8%) and its whole economy aspires as an exemplar, not only for African countries. Since 2000, the country has been considered as one of the fastest growing economies in Africa and in the world (Cyuzuzo, 2018). The country put efforts to stabilize and decrease its inflation rate. Even if, inflation registered a surge in 2016, principally, due to the poor performance of the agricultural sector inducing an increase of the food prices and transport costs, a controlled inflation rate around 7% reflects a good policy of the Rwandan Central Bank (BNR). To compare, neighboring countries registered a higher level, close to 20.2% for Burundi and 41.6%[7] for Democratic Republic of Congo.

Table 1: Rwanda's macro-economic indicators from 2000 to 2016[8]

Economic indicators	2000	2002	2004	2006	2008	2010	2012	2014	2016
GDP per capita (constant 2010 US$)	327,24	377,80	401,60	459,57	521,45	563,40	627,97	672,64	738,83
GDP growth (annual %)	8,37	13,19	7,45	9,23	11,16	7,33	8,65	7,62	5,98
Trade (% of GDP)	31,20	30,74	35,88	37,10	42,38	42,03	44,57	47,63	48,03
Gross capital formation (% of GDP)	13,38	13,48	15,03	16,80	23,98	22,98	25,71	25,29	25,88
Exports of goods and services (% of GDP)	6,32	7,04	11,12	12,15	12,55	12,04	12,79	14,72	14,93
Employment in services (% of total employment)	8,74	9,52	10,27	11,61	13,30	14,82	16,52	23,63	24,94
Employment in agriculture (% of total employment)	88,58	87,71	86,56	84,57	81,98	79,63	76,61	68,45	66,93
Inflation, consumer prices (annual %)	3,90	1,99	12,25	8,88	15,44	-0,25	10,27	2,35	7,17
Foreign direct investment, net inflows (% of GDP)	0,48	0,16	0,37	0,97	2,13	4,34	3,48	3,93	3,14
Inflation, GDP deflator (annual %)	2,78	-5,04	13,10	10,58	14,29	2,61	5,26	3,05	5,50
Government Debt to GDP (%)	102,53	107,96	92,08	23,70	19,48	19,96	19,97	29,13	37,30
Businesses indicators									
Start-up procedures to register a business (number)			9	9	8	6	7	8	5
Time required to start a business (days)			18	16	14	7	8	7	4
New businesses registered (number)				582	1136	3219	6655	9991	13120
Value added (% of GDP)									
Services	46,87	46,22	43,57	44,55	49,25	49,38	47,53	47,16	47,29
Industry (including construction)	15,81	15,13	12,94	13,35	14,61	14,82	16,53	17,18	16,37
Agriculture, forestry, and fishing	37,19	35,39	38,56	35,73	29,76	29,12	29,22	28,75	29,31
Manufacturing	7,34	7,49	6,65	6,04	5,56	6,18	5,99	5,89	5,81

A spectacular management of the governmental debt, divided by 3 over the last 16 years, has further strengthened the stability of the country. Domestic investments, represented by the gross capital formation, have doubled in solely 16 years. Their level attained 25% of the GDP in 2016 compare to 13% in 2000. Trade indicators also registered a good performance. At that time, exports of goods and services rose from 6 to 15%. Nowadays, both, exports and imports account for 48% of GDP. While, foreign direct investment accounts for more than 3% of GDP.

[3] Rwanda , Trading Economics,
[4] Rwanda GDP per capita, Trading Economics, World Bank.
[5] See World Bank Country and Lending Groups, https://datahelpdesk.worldbank.org/knowledgebase/articles/906519-world-bank-country-and-lending-groups, World Bank, accessed January 5th, 2019.
[6] National plan to economically transform the country into a middle-income economy by the year 2020. It set out phases for poverty reduction and economic development.
[7] See Inflation, GDP deflator (annual %), World Bank data, https://data.worldbank.org/indicator/NY.GDP.DEFL.KD.ZG?locations=CG, accessed January 5th, 2019.
[8] World Bank data, https://data.worldbank.org/country/rwanda, accessed January 2nd, 2019.

Dominated by the agricultural sector, the working population progressively fall, from 88% to 66% over the last 16 years. On the contrary, the share of population working in services still increases. Today, the service sector employs 1/5th of the working population. With the highest value added, it contributes to one-half of the total GDP. In contrast, the share of agriculture is steadily decreasing and represents only 30% of the total value added.

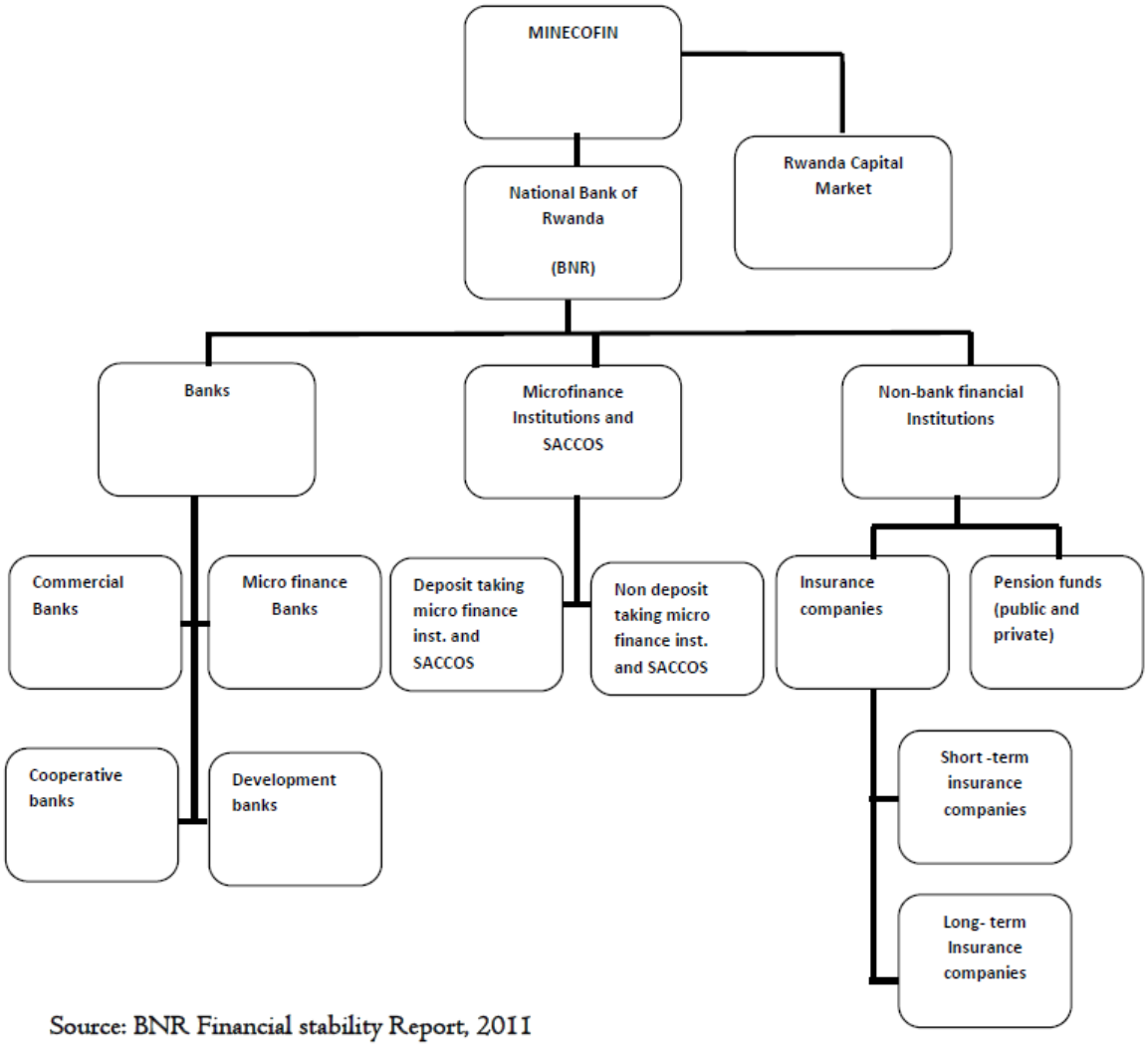
In terms of business, Rwanda again performs very well. The country is considered as a good place to develop business, by many. Politically stable, it benefits a lot of macroeconomic reforms. Year by year, the number of procedures necessary to start a business persistently decline. It decreased by half between 2004 and 2016, and nowadays it represents only 5. In addition, the time needed to start a business has been divided by 4 during the same period. In 2016, 4 days were needed to start a new business and for nationals, it can even be shorter, few hours only. Improvements in that field were spectacular, while in East Africa Community the average is still around ten procedures and twenty-two days[9]. The registration of new businesses strongly increased recent years, reinforcing its ranking position in the top 10 worldwide. To go with, the financial sector development has widely contributed to its performance. Next section, provides additional details about its evolution and its composition.

[9] See both indicators “start-up procedures to register a business (number)” and “time required to start a business (day)”, World Bank data, 05/01/2019.

Chapter 3: Components and development of the financial sector in Rwanda[10]

The financial sector includes two channels of financial intermediation[11]: direct and indirect. Direct financial intermediation consists to borrow directly from lenders in the financial markets by selling financial instruments which are claims on the borrower's future income or assets. We distinguish the primary financial market from the secondary market. In the first, new securities are issued, while in the second, securities previously issued are bought and sold. Indirect financial intermediation uses a middleman, called financial intermediary. The figure below (*figure 1*) illustrates the structure of the financial sector in Rwanda. It includes deposit taking financial institutions (DTIs), non-depository financial institutions (NDIs), sometimes called as non-banking financial institutions, financial markets and government regulatory agencies.

Figure 1: Structure of the Rwandan Financial Sector



Source: BNR Financial stability Report, 2011

This section provides information about the development of the financial sector in Rwanda. The first section describes the development of deposit financial institutions, while the second section focuses on the non-bank financial institutions. The third section explains the credit information system and the fourth focuses on the financial market. Finally, the last section presents broadly the supervision mechanism.

[10] Most information comes from: Gisanabagabo, S., 2017. Thesis: "Financial sector development and economic growth in Rwanda", Economics and Finance, University of KwaZulu-Natal, South Africa.

[11] There is also a third method, called securitization which combined a direct and an indirect financial intermediation.

1. Deposit financial institutions

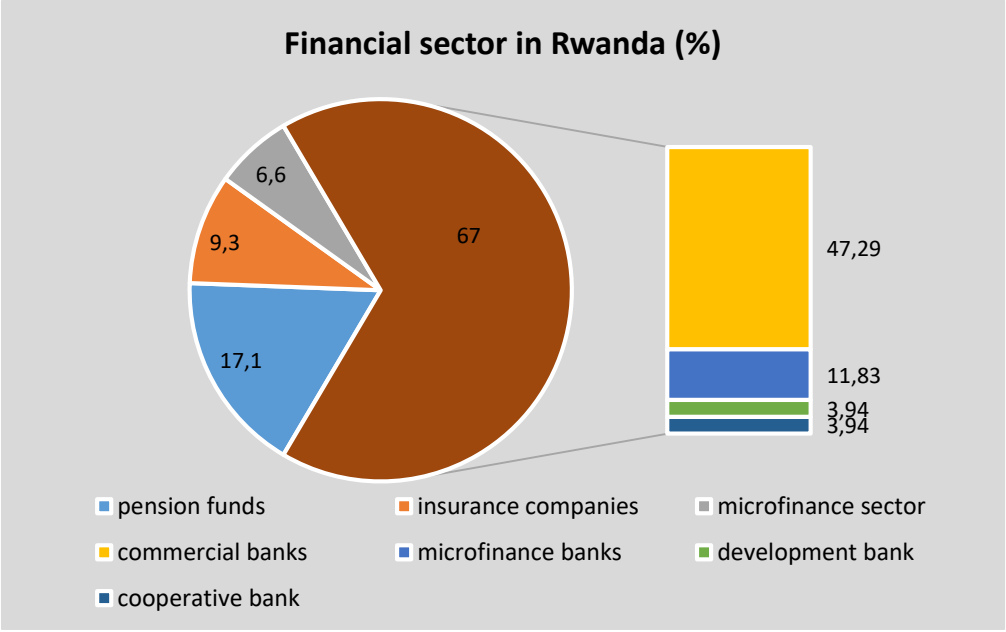
Deposits financial institutions provide a wide range of traditional financial services[12], from current accounts and systems of savings, to loans to companies and consumers. They include banks, microfinance institutions and savings associations, such as SACCOS.

Prior to 1994, Rwanda's financial sector contained solely 3 commercial banks, 2 specialized banks, operated less than 20 branches across the country, and 1 microfinance with 146 branches. Post-genocide period was characterized by the implementation of various reforms and the financial liberalization.

Around 2002, there were 6 commercial banks with 28 branches, 2 specialized banks and 1 union of financial institution with 148 branches (NBR, 2004). Major banks operated in the market were BCR, BK and ECOBANK. At that period, banking penetration in rural areas was very low. According to FinMark Trust survey elaborated in 2008, solely a handful of Rwandan population had access to banks and 52% were financially excluded (Gatera Sebagabo, 2009). Around 6% of the population held a saving account in a formal financial institution.

In 2015, the banking sector comprised 12 commercial banks, 3 microfinance banks, and 1 development and cooperative bank. This sector held 67% of total assets, while pension funds and insurance companies had respectively 17.1% and 9.3%. Despite its large number of institutions, microfinance sector allows for the smallest portion of financial assets, estimated at 6.6%. Non-banking financial institutions encompass 14 insurances companies, 12 private and 2 public. In terms of pension management companies, there is only 1 public social security fund, managed by the Rwanda Social Security Board (RSSB), and 57 private pension schemes under insurance companies.

Figure 2: Distribution of the financial sector in Rwanda, 2015.



1.1. Banking sector

Rwandan banking financial institutions are relatively few developed. Dominated by commercial banks, the sector includes specialized banks, such as development, microfinance or cooperative banks. Till 1975, the Rwandan banking sector gathered two commercial banks, the BCR (currently named I&M Bank) established in 1963, and the BK, implemented in 1966.

[12] Depending on the country financial development, deposit financial institutions do not limit their activities to traditional services but, progressively, tend to extend and provide general financial services.

In 1975, the first "Banque Populaire" was established at Nkamba. The first private bank, the BACAR (currently called GT-Bank) was registered in 1983. In 1986, all existing "Banques Populaires" formed a federation named UBPR. Later, UBPR became the BPR and signed a partnership with the Netherlands bank Rabobank, which bought 35% of its shares (Gatera Sebagabo, 2009).

The BRD was established in 1967. It assigned loans devoted to development projects in rural areas, especially in agriculture and industry. While the CHR, created in 1975, as a mortgage bank became a commercial bank (BHR) specialized in housing finance, in 2004. Both structures merged in 2011.

In 1995, the government launched some reforms. It strengthened the power of the Central Bank in order to regulate and supervise the whole sector. It implemented reforms implying a liberalization of interest rates and introduced new financial instruments. Between 1995 and 2000, three new private banks emerged, the BCDI, the BANCOR and COGEBANQUE.

A wave of internationalization started to occur. Since 2000, foreign banks penetrated the Rwandan financial sector, FINA Bank (a Kenyan commercial bank that acquired BACAR), Actis Capital (a UK private equity firm that bought 80% of BCR), and ECOBANK (which acquired BCDI and BANCOR, subsequently acquired by ACCESS Bank) (Gatera Sebagabo, 2009). Three regional banks obtained their licenses, two Kenyan, the KCB and Equity Bank, and the Crane Bank Ltd, from Uganda. In 2015, the Bank of Africa Rwanda Ltd get his license too. Similarly, ZIGAMA CSS, a financial cooperative dedicated exclusively to the national army and police, became a cooperative bank.

1.2. Microfinance sector

Since 2002, microfinance institutions are considered as a growing segment of the financial sector. Step by step, additional services have been proposed to clients. Progressively they became microfinance banks, considered as financial intermediaries which provide microfinance services, commercial bank products and services. Historically, associated to microcredit, nowadays, they offered a variety of financial products and services, including consumer loans, savings account, time deposits, micro insurance and international money transfers.

In 2006, 63 microfinance institutions were licensed. Two years later, 125 MFIs included around 111 SACCOs[13] (Mugenzi , 2014). The mobilized savings accounted for Rwf 65 billion out of Rwf 259 billion. Informal finance became so popular that in 2005, 73% of the population resorted to informal loans. Nevertheless, their lack of experience, characterized by poor corporate governance, weak information systems and significant losses, due to bad organization and mismanagement of loan portfolio, led to bankruptcy 9 of them (Gatera Sebagabo, 2009). A general panic hit the country in 2006. In 2008, Umurenge SACCOs providing savings scheme to 421 sectors, including the rural population, were introduced. Nowadays, there exist 493 microfinance institutions shared among 13 limited companies and 480 SACCOs. Around 64 are non-UMURENGE SACCOs and 416 are UMURENGE SACCOs.

2. Non-Bank Financial Institutions

NBFI include insurance companies, pension funds, investment funds, mutual funds, finance companies, stockbrokers and investment dealers.

2.1. Insurance companies

Insurance is a financial product which transfers risk from an individual or a firm to an insurance company in case of an unexpected event such as death, illness or an accident. There exist two categories of insurance: life insurance and nonlife insurance. A life insurance is a policy that provides a benefit if the insured person dies. This insurance covers people against financial hazards. A nonlife insurance includes property and causality insurance, health insurance, automobile insurance and sometimes reinsurance (Fraser 2005; Cecchetti 2011). Offering supportive and complementary infrastructure to banking sector, insurance companies provide financial

[13] SACCO is a financial institution that allow deposit and lending facilities.

protection against loss or damage. To reduce their exposure to risk, insurance companies uses reassurances, usually financially stronger.

Originally, Rwanda possessed two insurance companies, SONARWA created in 1975 and SORAS established in 1984. Since 2000, the private insurance sector started to grow and new companies offering various products and services emerged. Among twelve private insurance companies, ten were established after 2000. Three pubic medical insurance firms, namely MMI, RAMA CBHI, have joint the Rwandan market. Performing well, around 60% of total assets were shared among RAMA and MMI (NISR, 2008). In 2006, barely 3% of the active population held an insurance policy. In 2009, two major insurance companies, RAMA and SSFR, merged to form RSSB[14]. In 2013, 74%[15] of the population was covered by CBHI, an increase compare to 7% observed ten years before. Today, 14 major insurance companies[16] operate in the market.

2.2. Pension sector

The Rwandan pension sector contains only one public social security fund, the RSSB (formerly called CSR), created in 1962. Over previous years, the pension sector registered rather dark perspectives, due to low penetration, only 5.6%[17] for CSR and 0.1% for private pension, in 2006 (Gatera Sebagabo, 2009). Due to a lack of voluntary pension scheme, majority of the Rwandans working in SMEs, as well as, self-employed were excluded from the pension privileges. With more than 85% of the population working in the informal sector, private pension appeared as a solution to resorb the low pension penetration. Three years later, only 8% of the active population had a pension scheme (NBR). At that time, 10 private pension funds operated in the country. Recently, private pension schemes[18] started to be developed and new companies have joined the market. The latest was Liaison Group, in partnership with KCB Bank Rwanda.

3. Credit information system in Rwanda

The private CRB collects credit information to reduce moral hazard risks and adverse credit guarantees. All financial institutions must provide this information. Some companies, such as MTN, TIGO, Rwanda Energy Group Ltd, Water and Sanitation Agency have voluntary integrated the credit information system. The CRB provides information on NPLs borrowers' loans. This information contributes significantly to the evaluation of new loans applications.

4. Financial market

Established in 2007, but launched in 2011 under the coordination of the CMAC, the RSE allows to purchase and to sell assets, such as stocks and bonds. Under the Capital Market Act of 2011, CMA guides the development of the capital market inside the country. Solely 7 companies[19] trade their equities at the RSE. Both, Equity Group Holding Ltd and Crystal Telecom Ltd joined RSE in February and May 2015, respectively (NBR[20], 2016).

The capital market is still underdeveloped, in terms of volume and the number of registered companies. In 2010, traded share represented only 0.03% of the Rwandan GDP, less compare to EAC members, with 0.26% for Tanzania, 0.29% for Uganda, 2.4% for Kenya (MINECOFIN[21], 2013). Since 2014, the National Bank of Rwanda and the Ministry of Finance decided to issue Government Treasury Bonds to promote Rwandan capital market and to put available marketable financial instruments. The aim was to provide additional savings opportunities to

[14] https://www.social-protection.org/gimi/gess/ShowWiki.action;jsessionid=qQH1YwKNnHTJ2pfqXwyZTbxJkqhFJJJsG2ylv8ZJNTkzNj3dkGTd!165969964?id=789&lang=FR, accessed January 30th, 2019.

[15] Report "The development of Community-Based Health Insurance in Rwanda: Experiences and Lessons", March 2016, Management Sciences for Health.

[16] https://insurancehorn.com/list-of-insurance-companies-in-rwanda/, accessed January 30th, 2019.
RSSB-Medical Scheme, MMI, Sonarwa General Insurance Ltd, Soras AG Ltd, Soras-Vie Ltd, Corar AG Ltd, Prime Insurance Ltd, Phoenix of Rwanda Assurance Company SA, Prime Life Insurance Ltd, Sonarwa Life Assurance Company Ltd, UAP Insurance Rwanda Limited, Radiant Insurance Company, Britam Insurance Company Rwanda Ltd and Corar Vie Ltd.

[17] Report "National Social Security Policy", Ministry of Finance and Economic Planning, Republic of Rwanda, February 2009.

[18] Mwai, C. June 2018, "Private pension scheme debuts in Rwanda", The News Times.

[19] Bralirwa Ltd, Bank of Kigali Ltd, Kenya Commercial Bank Ltd, Crystal Telecom Ltd, Nation Media Group Ltd, Ucumi Supermarket Ltd and Equity Group Holding Ltd.

[20] National Bank of Rwanda.

[21] Ministry of Finance and Economic Planning.

firms and households. The Bond duration varied between three, five, seven or ten years. The development of the capital market has led to debt securities transactions. On May, 2014, the IFC listed Umuganda bond worth $US 22 million over five years. With local, regional and international investors, the bond has strengthened investors' confidence and has provided additional investment opportunities for domestic investors. According to CMA (2015), the total amount of funds[22] represented Frw 55 billion. In 2016, market capitalization went down due to general economic performance, a low client turnover and low level of traded products. Over the period, RSE registered 170 billion and $US 86 million of transactions. Currently, RSE holds 12 bonds, of which ten are issued by the Government and two others are corporate bonds.

5. Supervision of the financial sector

In Rwanda, the financial sector is regulated and supervised by the BNR created in 1964, and the CMA. The BNR regulates and supervises the banking sector, microfinance sector and non-banking financial institutions. While, the CMA regulates and supervises the RSE.

To stabilize the financial sector, BNR set the FSC, in 2012. The committee identifies risks associated to sector, publishes its findings, monitors the sector and undertakes corrective measures, if needed. The BNR inspects whether the pension sector is managing the funds correctly and whether the insurance sector is performing well.

[22] Cyuzuzo, G. 2018. "Factors influencing the development of capital markets in Rwanda: a case study of the Rwanda stock exchange", Jönköping International Business School, Sweden, EARP-EF No. 2018:27.

Chapter 4: Assessment of the domestic financial system

Based on a more analytical approach, this chapter assesses the national financial system. Our data come from the World Bank's Financial Development Database and are available from 1995 to 2016. To better compare the evolution of the financial system, we compare our data with low-income economies. This part lays the foundation for our last chapter, devoted to empirical analysis.

Financial sector encompasses many components put in a multidimensional way. In short, a deep financial system do not necessary indicate a high level of financial access, similarly, a highly efficient financial system is not necessary more stable than a less efficient one, and so on. To face with, Čihák et al. (2012) have proposed relevant characteristics to measure the financial sector development, summarized in a four-dimensional matrix: the size of financial institutions and markets (*depth*), the degree to which individuals can use financial institutions and markets (*access*), the efficiency of financial institutions and markets in providing financial services (*efficiency*), and the stability of financial institutions and markets (*stability*). All make a distinction between financial institutions and financial markets (equity and bond markets), as described in the *table 2*.

Table 2: The World Bank's '4x2 matrix of financial system characteristics'

	FINANCIAL INSTITUTIONS	FINANCIAL MARKETS
DEPTH	**Private sector credit to GDP** Financial institutions' assets to GDP M2 to GDP Deposits to GDP Gross value-added of the financial sector to GDP	**Stock market capitalization plus outstanding domestic private debt securities to GDP** Private debt securities to GDP Public debt securities to GDP International debt securities to GDP Stock market capitalization to GDP Stocks traded to GDP
ACCESS	**Accounts per thousand adults** (commercial banks) Branches per 100,000 adults (commercial banks) % of people with a bank account % of firms with line of credit (all firms) % of firms with line of credit (small firms)	**Percent of market capitalization outside of top 10 largest companies** Percent of value traded outside of top 10 traded companies Government bond yields (3 month and 10 years) Ratio of domestic to total debt securities Ratio of private to total debt securities (domestic) Ratio of new corporate bond issues to GDP
EFFICIENCY	**Net interest margin** Lending-deposits spread Non-interest income to total income Overhead costs (% of total assets) Profitability (return on assets, return on equity) Boone indicator (or Herfindahl or H-statistics)	**Turnover ratio** (turnover/capitalization) for stock market Price synchronicity (co-movement) Private information trading Price impact Liquidity/transaction costs Quoted bid-ask spread for government bonds Turnover of bonds (private, public) on securities exchange Settlement efficiency
STABILITY	**Z-score** (or distance to default) capital adequacy ratios asset quality ratios liquidity ratios other (net foreign exchange position to capital etc)	**Volatility** (standard deviation / average) of stock price index, sovereign bond index Skewness of the index (stock price, sovereign bond) Vulnerability to earnings manipulation Price/earnings ratio Duration Ratio of short-term to total bonds (domestic, int'l) Correlation with major bond returns (German, US)

Source: Čihák *et al. (2012)*

1. Depth

In financial development, depth reflects the size. It expresses how much the financial sector is based on banks and financial markets. For financial institutions, main indicators are the following: private sector credit to GDP, which defines the credit from the deposit banks to the private sector as a percentage of GDP, the financial institutions' assets to GDP, which are considered as the sum of banks' assets and non-bank financial institutions divided by GDP. M2 to GDP expresses the total amount of the banking system from which banks can lend, the

ratio of deposits to GDP corresponds to the amount of cash held by depositors in the form of current account deposits, as well savings and term deposits. Finally, the gross value added of the financial sector to GDP provides information how financial institutions contribute to economic output.

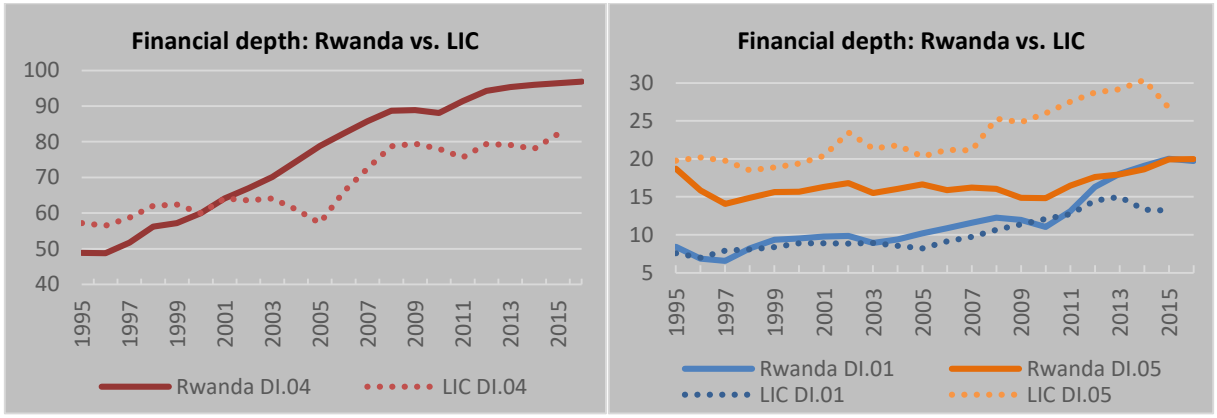
Regarding financial markets, the volume of private and public debt securities relative to GDP indicates the size of the bond markets, stock market capitalization relative to GDP approximates the size of the stock markets, and stock traded to GDP equals the value of stock market transactions, as a share of GDP.

Figure 3, on the left side, shows a positive trend of the deposit money bank assets to deposit money bank assets and central bank assets (*DI.04*). During the 90's, the country was under the LIC level, but has quickly improved its financial penetration. Since 2000, the country performed much better than LIC, indicating a higher level of Rwandan assets held by deposit banks.

The figure on the right, shows a similar trend of the private credit by deposit money banks (DI.01) for both groups. This indicator isolates credit issued to the private sector, as opposed to credit issued to governments and public enterprises, and focused only on the credit issued by intermediaries, excluding the central bank. It measures the main activity of financial intermediaries which is to channel savings to investors. Despite a common trend, the level of credit provided by financial institutions surged more in Rwanda around 2010, allowing him to stimulate economic activity, thanks to loans.

Last indicator (*DI.05*), on the right, measures monetary resources mobilized by banks. It reflects the size of financial intermediaries relative to the size of economy. The ratio of liquid liabilities to GDP in Rwanda remains much more constant and is below the LIC. But, regardless of the size of the financial system, this indicator is not directly related to financial services because it does not provide information on risk management and information process.

Figure 3: Financial depth, Rwanda vs. LIC



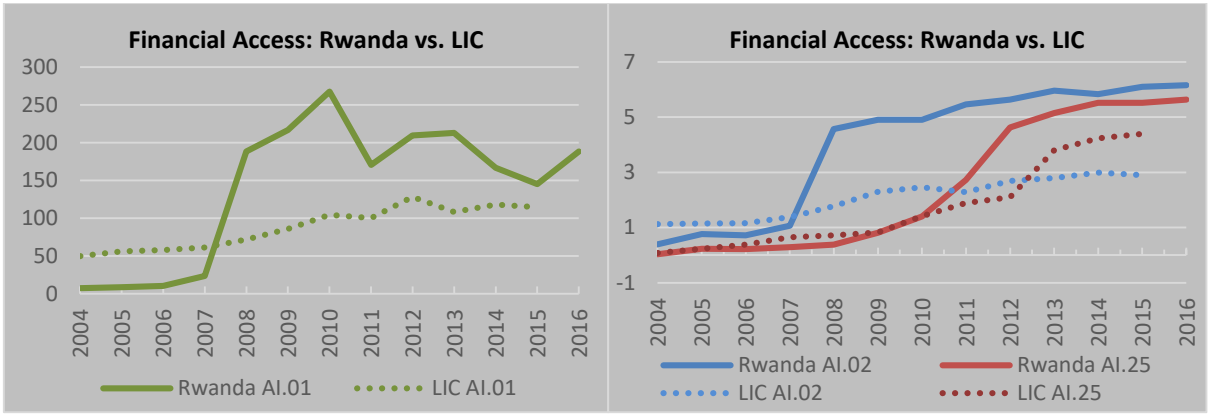
2. Access

Financial access refers to the degree to which the public, including population and companies, can access to financial services. Fundamentally, a well-functioning financial system allocates capital according to the quality of project and entrepreneur. An expanded access can provide financial services to a wider range of companies and households. To estimate access to financial institutions, the most commonly used variables are the number of adult having a bank account, the number of branches per 100,000 adults and the level of firms having a credit line. However, it is important to keep in mind some existing weaknesses. In fact, the number of bank branches remains biased given the existence of banks without agencies. Similarly, a confusion can occur because several accounts are held by a single client, preventing to estimate the exact level of bank accounts.

Financial market data are scarce. To evaluate the stock and bond markets, market concentration is widely used. This variable includes the percentage of market capitalization outside the top 10 companies. Others, such as government bond yields, the ratio of domestic/or private to total debt securities or the ratio of new corporate bond issues to GDP are also commonly used. The underlying idea is that a high concentration index is the main

barrier to market access for new or smaller issuers. In the case of Rwanda, only access to financial institutions is available, there are no successive data for the financial markets.

Figure 4: Financial access, Rwanda vs. LIC



The *figure 4*, on the left, illustrates a spectacular financial access in Rwanda. Started with 7 times less bank accounts per 1,000 adults (*AI.01*) in 2004, Rwanda has rapidly improved banking access to clients. The development of bank internationalization and microfinance banks has increased the number of bank account held in the country.

On the right side, commercial bank branches (*AI.02*) include retail establishments of commercial banks and other resident banks that provide financial services to clients. These recent years, their number per 100,000 adults has significantly rose. They also performed better than LIC. Nowadays, Rwanda has 2 times more agencies.

On same figure, ATMs (*AI.25*) are computerized telecommunications devices, which provide access to financial transactions in a public place. Advantages of automated teller machines are multiples, especially, they give access to financial transactions without going to the bank. Initially similar, the constant development of Rwandan financial institutions allowed, in 2010, to exceed the LIC level and to progress more rapidly.

3. Efficiency

Efficiency measures the cost of intermediation credit. For financial institutions, the main indicators contain variables such as overhead costs to total assets, net interest margin, lending-deposits spread or profitability. Although, efficient financial institutions tend to be more profitable, their relationship is not so clear. Because, during an economic upswing even an inefficient financial system can be highly profitable. On the contrary, during an adverse shock, even an efficient one can generate some losses.

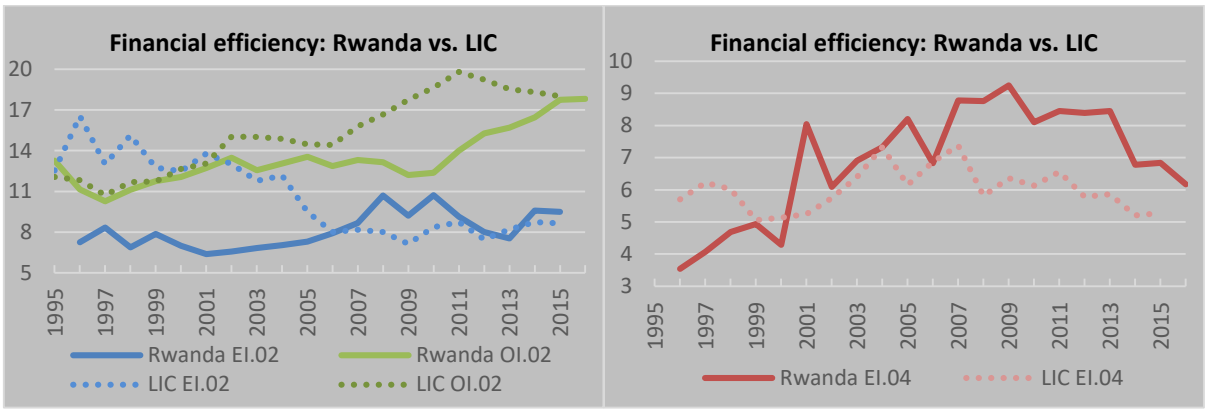
In case of financial markets, efficiency is focused on transactions. The turnover ratio is a basic measure of the stock market. It expresses that the higher turnover, the more liquid and then the more efficient the market is. For the bond market, the most common variable are the quoted bid-ask spread and the turnover of bonds.

Looking the efficiency indicators on the left side of the *figure 5* shows the bank lending-deposit spread (*EI.02*). Rwanda has observed a positive and slightly upward trend, while LIC economies have gradually reduced their spread. Since 2007, Rwandan bank lending-deposit spread exceeded the LIC. Thus, a higher rate is charged on loans in the private sector face to three-month deposits. And, people who want to lend money should pay a higher rate than the one receive on their deposits. As a result, the cost of credit in Rwanda is more expensive.

To go in hand, the bank's overhead costs to total assets (*EI.04*) observed in the right side, are also slightly higher. However, the tightening of banking regulations put in place after the financial crisis led to lower costs, for both.

Till 2001, the level of bank deposit to GDP (OI.02) was similar, for both categories. Rwanda registered a constant trend till 2011, while LIC started to progress since 2006. Recently, Rwanda has caught up the LIC level. Substantially, banks in Rwandan are a few less efficient but they remain close to similar economies.

Figure 5: Financial efficiency, Rwanda vs. LIC

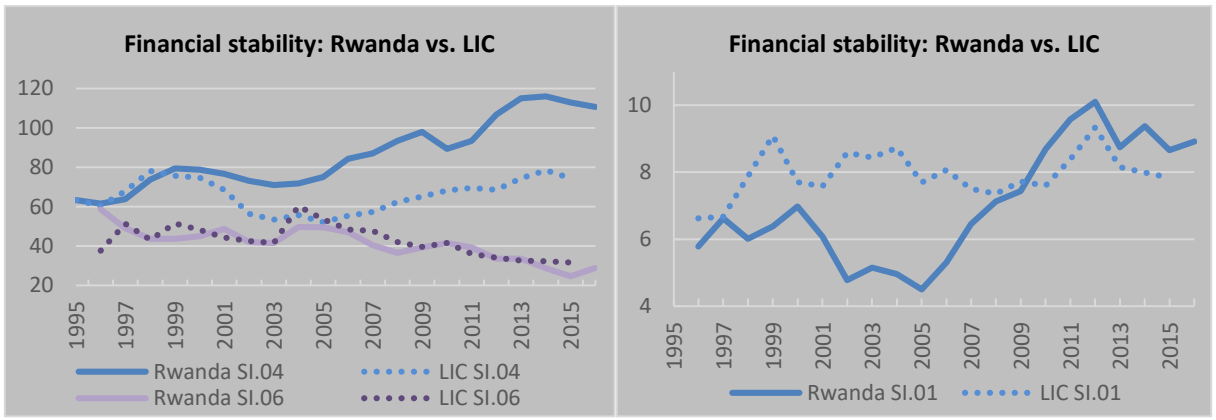


4. Stability

Stability takes part of the financial development process and lays the foundation for macroeconomic stability. A vast literature is devoted to this topic, particularly using systemic risk measure and stress tests. The Z-score is the key variable to measure financial stability. More explicitly, it compares buffers (capitalization and returns) with potential risk (return volatility). This variable became the more and more popular because it was inversely related to the probability of financial institutions insolvency.

For financial markets, the reference proxy is the market volatility, although other proxies are also widely used. One of them is the skewness of stock returns which indicates that a market with a more negative skewed distribution of stock returns generates larger negative returns and increases instability. Vulnerability to earnings manipulation is another important variable that provides information presented in the financial statements. This variable represents the percentage of companies listed on the stock exchange that are subject to manipulation. Finally, some others, such as the price on earnings ratio or duration, are also used. These variables are based on empirical facts, according which, market prices contain expectations of future cash flows and growth, and therefore suggest that stock prices may be more volatile and have a negative impact in the future.

Figure 6: Financial stability, Rwanda vs. LIC



With a relatively identical level, around the 90's, Rwandan bank credit to bank deposits (*SI.04*), observed on left in the *figure 6*, has rapidly increase. While, LIC followed a more stable and shy development. The indicator shows that financial resources provided to the private sector by domestic money banks, as a share of total deposits, followed a positive trend. Thereby, Rwanda banks have provided more credits compare to deposits, increasing their exposure.

On the right, the bank Z-score (*SI.01*) in Rwanda registered a spectacular trend since 2005. While, LIC remained relatively constant. A higher bank Z-score implies a lower probability of insolvency and higher bank stability. Since the latest financial crisis, Rwanda banks have become more stable and safer than LIC banks.

On the left, liquid assets to deposits and short term funding (*SI.06*) have shown a similar downtrend in both groups. More, Rwandan liquidity assets decreased slightly more. Generally a decline of this indicator should be monitor because it may lead to liquidity shortages during a crisis or an instability. To conclude, even if Rwandan banks provide a higher level of credit, they remain more stable than LIC banks, thanks to a prudential policy held by the Central Bank and the FSC set up in 2012.

5. Financial variables promoting growth in Rwanda

This analysis highlights financial variables that favored economic growth in Rwanda. As illustrated, we observe which variables contributed positively to growth. The improvement of depth indicators, such as banks deposits have strengthened banking activity by providing additional resources needed to develop the country economy. An easier access to bank accounts, more commercial bank branches and ATMs have improved the access to banking services, especially for people living in rural and isolated areas. In addition, the growing number of institutions, including microfinance banks has expanded the beneficiary audience to more vulnerable people allowing them out of the poverty.

Lower bank overhead costs have improved the banking efficiency and have made them healthier. Complementary, stability indicators as the bank Z-score has reinforced the banking ability to cope with default and insolvency. Greater stability has strengthen the international banking position allowing to seek additional funds from foreign banks and international organizations.

Chapter 5: Empirical analysis

This last chapter analyzes the relationship between the financial sector development and economic growth in Rwanda.

The first section presents the data collection and the model. The next two sections provide brief information about the analysis. The fourth section presents graphically the variables and makes a brief comment. The next two sections, exhibit the two linear regressions and their findings. Finally, the seventh section, summaries the findings and presents some limits.

1. Collection of data and model

The annual data collected were obtained from the World Bank Global Development data and the Global Financial Development database, going from 1995 to 2016. To avoid misleading information, the selected period begins after the genocide. Indeed, the inclusion of previous years could disturb the conclusions because of high economic and financial volatilities observed at that time. Taking into account a relatively short period of availability and the complexity to obtain relevant results, we analysis two relationships. The objective was to examine some roots of financial development that contributed to improve economic growth.

The study uses a descriptive time series correlation method. The dependent variable represents the economic growth, expressed by the per capita annual growth rate of the real gross domestic product. While independent variables are represented by financial depth, efficiency and stability development indicators, as well as other economic indicators.

The selected depth indicator includes the ratio of liquid liabilities to GDP (also known as broad money, or M3). According Saqib (2013), broad money has positively impacted the economic growth, while some as Okello (2015) mentioned that his impact has been detrimental to growth. The financial system deposits to GDP expressed as the demand, time and savings deposits in deposit money banks and other financial institutions and the domestic credit to private sector (in % of GDP), referred to financial resources provided to the private sector. Still, according to Okello (2015), the author found evidence about a positive and significant impact of deposits and private credit on economic growth. Gisanabagabo and Ngalawa (2017) found that domestic credit contributed the most to fluctuations in the real output growth. On the contrary, work of Venâncio (2013) has exposed the negative impact of domestic credit on growth.

The efficiency indicator is the bank net interest margin which represents the accounting value of bank's net interest revenue as a share of its average interest-bearing (total earnings) assets. The stability indicator is the bank Z-score which captures the probability of default inside commercial banking system.

Economic indicators include the annual growth rate of gross fixed capital formation, considered as the level of investment to nominal GDP and the domestic credit provided by the financial sector. Saqib (2013) and Cyuzuzo (2018) supported the idea of a positive impact of gross fixed capital formation on growth. Annual inflation, which measures the average cost of consumer prices is used as a control variable. According, Zogjani and Mazelliu (2015) inflation contributed positively to growth.

2. Analysis of data

Our data were checked for completeness and consistency. However, due to missing data for the bank net interest margin and bank Z-score in 1995, an estimation was done for these both values. The data were analyzed using spreadsheets and were presented in times series, graphs and tables for an easier understanding with the software MATLAB.

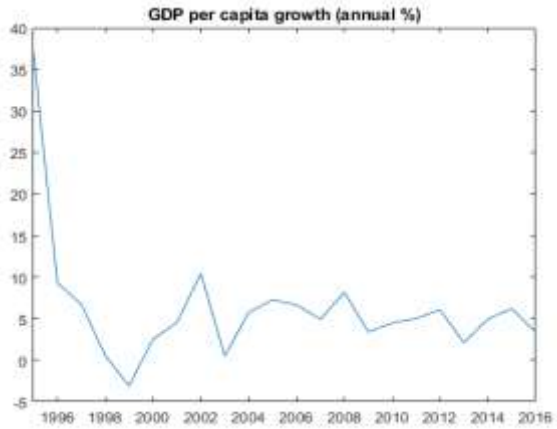
3. Test of significance

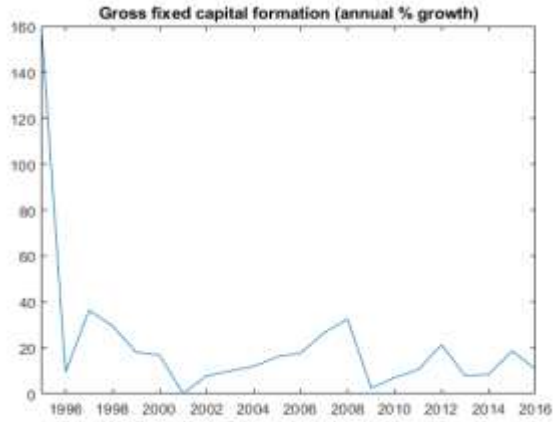
The test of significance employs correlations of coefficients. The tStat at 95% or at 90% confidence determines the statistical importance of the constant term α, and the coefficient terms. The F test determines whether the regression is statistically significant with a 95% or 90% confidence level. The coefficients of determination, R and

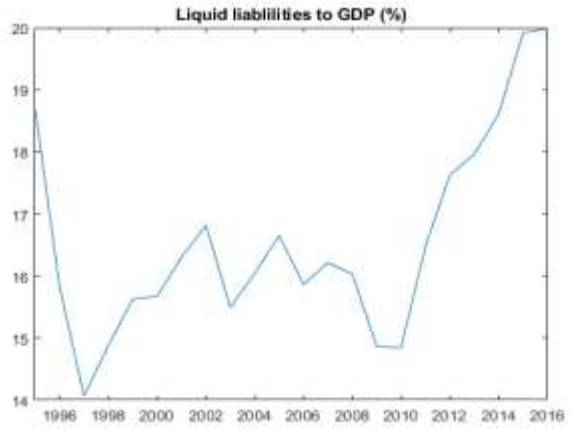
the Adjusted R^2 indicate the magnitude of the variation, as the variation of the dependent variable in the independent variables.

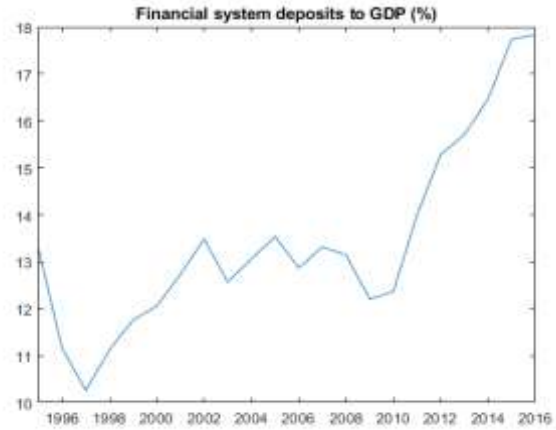
4. Descriptive statistics

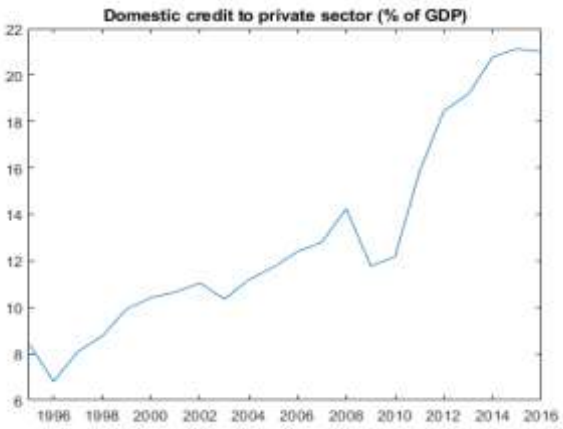
4.1. Figures (from figure 7 to figure 15)

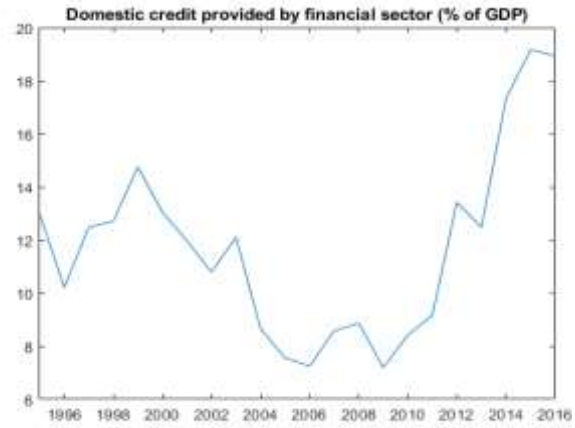












The following figures show the evolution of economic variables in Rwanda post genocide period. As observed since 1997, an increase of the liquid liabilities and financial deposits contributed positively to the GDP growth. Over the entire period, these two variables exhibited a similar tendency, first a positive trend since 1997, then a stabilization for few years combined with some volatility until 2008, then a spectacular rise till nowadays. This significant increase around 2010, contributed positively to the credit allocation. At same time, a similar trend among domestic credit provided by financial sector and bank z-score was observed. Thus, the increase level of credit granted by banks did not aggravate the banking instability, because this process took place simultaneously during the phase of higher banking stability.

4.2. Statistics summary

Table 3: Descriptive statistics

Descriptive statistics	Mean	Standard deviation	Maximum	Minimum
GDP per capita growth	6.23	7.51	36.98	-3.06
Gross fixed capital formation	21.58	31.43	155.78	0.06
Liquid liabilities to GDP	16.56	1.6	19.99	14.06
Financial system deposits to GDP	13.45	2.02	17.82	10.26
Domestic credit to private sector	13.05	4.41	21.13	6.80
Inflation	6.75	4.56	15.43	-2.41

Domestic credit provided by financial sector	11.72	3.5	19.16	7.18
Bank net interest margin	11.01	2.2	16.49	8.27
Bank Z-score	6.97	1.71	10.09	4.5

5. First multiple linear regression

5.1. Correlation analysis

Table 4: First correlation analysis

tableCorrelation = 6×7 table

	titleVariables	Gdp_capita	Liquid_liabilities	Domestic_credit	Z_score	Net_margin	Inflation
1	"Gdp_capita"	1.0000	0.3157	-0.2079	-0.1928	-0.0050	0.2865
2	"Liquid_lia...	0.3157	1.0000	0.7454	0.4172	-0.4396	-0.1458
3	"Domestic_...	-0.2079	0.7454	1.0000	0.7626	-0.5750	-0.1388
4	"Z_score"	-0.1928	0.4172	0.7626	1.0000	-0.2683	-0.2102
5	"Net_margin"	-0.0050	-0.4396	-0.5750	-0.2683	1.0000	0.0369
6	"Inflation"	0.2865	-0.1458	-0.1388	-0.2102	0.0369	1.0000

table_pvalueCorr = 6×7 table

	titleVariables	Gdp_capita	Liquid_liabilities	Domestic_credit	Z_score	Net_margin	Inflation
1	"Gdp_capita"	1.0000	0.1523	0.3532	0.3900	0.9825	0.1961
2	"Liquid_lia...	0.1523	1.0000	0.0001	0.0534	0.0406	0.5172
3	"Domestic_...	0.3532	0.0001	1.0000	0.0000	0.0051	0.5379
4	"Z_score"	0.3900	0.0534	0.0000	1.0000	0.2272	0.3478
5	"Net_margin"	0.9825	0.0406	0.0051	0.2272	1.0000	0.8705
6	"Inflation"	0.1961	0.5172	0.5379	0.3478	0.8705	1.0000

A strong positive and significant correlation is observed among domestic credit and liquid liabilities, and between domestic credit and Z-score.

5.2. Regression analysis

Analytical model 1:

The first relationship is presented as below:

$$y = \alpha + \beta_1 M + \beta_2 CR + \beta_3 Z + \beta_4 Nm + \beta_5 I + \epsilon$$

Where:

y is the economic growth measured as the annual growth rate of per capita GDP ;

α is a constant term (*Intercept*) ;

***β*$_{1,2,3,4,5}$** are regression coefficients of the variations to determine the volatility of each variable to economic growth in the regression model ;

M is the ratio of liquid liabilities to GDP (M_3) (x_1) ;

CR is the ratio of domestic credit to private sector expressed in % of GDP (x_2) ;

Z is the bank Z-score (x_3) ;

Nm is the bank net interest margin (%) (x_4) ;

I is the annual growth of inflation (x_5) ;

ε is the error term.

```
Linear regression model:
    y ~ 1 + x1 + x2 + x3 + x4 + x5

Estimated Coefficients:
                   Estimate      SE        tStat       pValue
                   ________    _______    _______    __________

    (Intercept)     -66.308     15.101    -4.3909    0.00045579
    x1               6.0275    0.92727     6.5002     7.32e-06
    x2              -2.9624    0.54572    -5.4286    5.5741e-05
    x3               2.6107    0.95648     2.7295      0.014847
    x4             -0.99446    0.53922    -1.8443      0.083744
    x5               0.6079    0.20773     2.9265     0.0098828


Number of observations: 22, Error degrees of freedom: 16
Root Mean Squared Error: 4.21
R-squared: 0.761,  Adjusted R-Squared 0.687
F-statistic vs. constant model: 10.2, p-value = 0.000155
```

Estimated coefficients in our linear regression model are almost all statistically significant at 95% confidence because their p-values are lower than 0.05, except for the bank net interest margin which is statistically significant at 90% confidence, with a p-value lower than 0.1. The intercept considered as the constant term worth -66.308. His high value indicates that there would be a negative per capita GDP growth independent of liquid liabilities, domestic credit, bank Z-score, bank net interest margin and inflation. The positive value of the coefficient of liquid liabilities indicates that 1 percent increase of the broad money would result to a 6.02 percent of the increase of the per capita GDP. The negative sign of the domestic credit indicates that an increase of 1 percent of the domestic credit to the private sector would decrease the per capita GDP by 2.96 percent. The positive value of the bank Z-score means that an increase by 1 of the Z-score would improve the per capita GDP by 2.61 percent. The negative sign of the bank net interest margin specifies that a 1 percent increase of this coefficient would reduce the per capita GDP by 0.99 percent. Finally, the positive impact on the inflation indicates that a growth of 1 percent of the inflation would improve the per capita GDP by 0.6 percent.

Interpretation of the findings

The coefficient of liquid liabilities measures the sum of currency and deposits in the central bank (M0), plus transferable deposits and electronic currency (M1), plus time and savings deposits, foreign currency transferable deposits, certificates of deposit, and securities repurchase agreements (M2), plus travelers checks, foreign currency time deposits, commercial paper, and shares of mutual funds or market funds held by residents. The positive impact of this coefficient is in line with findings done by King and Levine (1993) which found a statistically significant positive relationship between both variables. In fact, increasing the level of money supply to households and businesses, to make additional payments or short-term investments in currency or funds in bank accounts, can have a positive impact on economic growth.

The ratio of the domestic credit to private sector refers to financial resources provided to the private sector by financial corporations (as monetary authorities, deposit money banks, pension funds, insurance corporations, money lenders), through loans, purchase of nonequity securities, and trade credits and other accounts receivable. Generally, the negative impact of excessive and rapid credit “over-stressed” the economic growth. However, in the case of Rwanda, credit remained weak compare to neighboring countries and its recent increase did not last long enough to offset its effects on economic growth. The bank Z-score, in line with our expectations, indicates that the higher distance to default, the more stable the bank is and the lower is the probability of insolvency. Thus, a positive and increasing Z-score improves the economic growth.

The negative and significant impact of bank interest margin on economic growth indicates an inverse relationship. Indeed, improving the banking sector, due to higher productivity and competition among financial institutions decreases the net interest margin and contributes positively to economic growth (Zeki et al. 2013). On the contrary, higher level of bank net interest margin decreases the economic growth due to lower competition and lower efficiency in the banking sector.

Inflation used as a control variable has a positive impact on economic growth. Various links exist among inflation and economic growth, they can be positive, negative or neutral. Empirical studies on developed and industrial countries provide facts on a negative relationship, while those on developing countries revealed a positive relationship (Švigir and Miloš, 2017), similarly as observed in Rwanda. Although all agree that high inflation has a negative effect on economic growth. In Rwanda, the inflation observed between 1995 and 2016 was under control and did not reach extreme values, promoting economic growth.

The second regression presented below, analysis the impact of gross fixed capital formation and domestic credit provided by financial sector. The objective was to observe how investments and another variable of domestic credit affected economic growth.

6. Second multiple linear regression

6.1. Correlation analysis

Table 5: Second correlation analysis

tableCorrelation = 6×7 table

	titleVariables	Gdp_capita	Liquid_liabilities	Fin_deposits	Domestic_cre...	Fixed_cap_for...	Inflation
1	"Gdp_capita"	1.0000	0.3157	0.0148	-0.0470	0.8780	0.2865
2	"Liquid_lia...	0.3157	1.0000	0.9164	0.6705	0.2178	-0.1458
3	"Fin_depos...	0.0148	0.9164	1.0000	0.5921	-0.0899	-0.1533
4	"Domestic_...	-0.0470	0.6705	0.5921	1.0000	0.0832	-0.3896
5	"Fixed_cap...	0.8780	0.2178	-0.0899	0.0832	1.0000	0.2693
6	"Inflation"	0.2865	-0.1458	-0.1533	-0.3896	0.2693	1.0000

table_pvalueCorr = 6×7 table

	titleVariables	Gdp_capita	Liquid_liabilities	Fin_deposits	Domestic_cre...	Fixed_cap_for...	Inflation
1	"Gdp_capita"	1.0000	0.1523	0.9479	0.8353	0.0000	0.1961
2	"Liquid_lia...	0.1523	1.0000	0.0000	0.0006	0.3303	0.5172
3	"Fin_depos...	0.9479	0.0000	1.0000	0.0037	0.6908	0.4957
4	"Domestic_...	0.8353	0.0006	0.0037	1.0000	0.7129	0.0731
5	"Fixed_cap...	0.0000	0.3303	0.6908	0.7129	1.0000	0.2255
6	"Inflation"	0.1961	0.5172	0.4957	0.0731	0.2255	1.0000

A strong and positive correlation is observed among GDP per capita and gross fixed capital formation, and between financial deposits and liquid liabilities, and finally between domestic credit provided by the financial sector and liquid liabilities.

6.2. Regression analysis

Analytical model 2:

The second relationship is presented below:

$$y = \alpha + \beta_1 M + \beta_2 FD + \beta_3 CRfin + \beta_4 K + \beta_5 I + e$$

Where:

y is the economic growth measured as the annual growth rate of per capita GDP ;

α is a constant term (*Intercept*) ;

β1,2,3,4,5 are regression coefficients of the variations to determine the volatility of each variable to economic growth in the regression model ;

M is the ratio of liquid liabilities to GDP (M_3) (x_1) ;

FD is the financial system deposits to GDP (x_2) ;

CRfin is the ratio of domestic credit provided by the financial sector expressed in % of GDP (x_3) ;

K is the annual ratio investment/GDP which will be computed as annual growth rate of gross fixed capital formation divided by nominal GDP (x_4) ;

I is the annual growth of inflation (x_5) ;

ε is the error term.

```
Linear regression model:
    y ~ 1 + x1 + x2 + x3 + x4 + x5

Estimated Coefficients:
                   Estimate      SE        tStat       pValue
                   ________    _______    _______    __________

    (Intercept)     -35.977     11.349    -3.1701     0.0059389
    x1               4.9311     1.6205     3.0429     0.0077528
    x2              -2.4038     1.1882     -2.023      0.060109
    x3             -0.89277    0.25759    -3.4658     0.0031855
    x4              0.14887    0.03279       4.54    0.00033472
    x5             0.016727    0.16006    0.10451       0.91806


Number of observations: 22, Error degrees of freedom: 16
Root Mean Squared Error: 2.82
R-squared: 0.893,  Adjusted R-Squared 0.859
F-statistic vs. constant model: 26.6, p-value = 3.19e-07
```

Estimated coefficients in our second model are almost all statistically significant at 95% confidence (p-values are lower than 0.05), except the financial system deposits which is statistically significant at 90% confidence (p-value lower than 0.1). Exceptionally in this model, our control variable which is the inflation is not statistically significant but still has a positive sign. The intercept, considered as the constant term, worth -35.98. His value indicates that there would be a negative per capita GDP growth independent of liquid liabilities, financial deposits, domestic credit provided by the financial sector, gross fixed capital formation and the inflation.

The positive value of the coefficient of liquid liabilities indicates that 1 percent increase of the broad money would result to a 4.93 percent of increase of the per capita GDP. Both, financial deposits and domestic credit are negative. Thus, an increase of 1 percent of the financial system deposits decline the per capita GDP by 2.4 percent. Similarly, an increase by 1 percent of domestic credit reduce the per capita GDP by 0.89 percent. The positive sign of the gross fixed capital formation indicates that 1 percent increase of that coefficient would improve the per capita GDP by 0.14 percent.

Interpretation of the findings

Our second linear regression gives similar results. There is still a positive relationship with liquid liabilities. The financial system deposits to GDP is the ratio of all checking, savings and time deposits in banks and financial institutions to economic activity. It serves as a stock indicator of available deposit resources for the financial sector as part of its lending activities (World Bank, 2009). Our coefficient has a negative impact on economic growth. In reality, it is not the level of deposits which prevails in economic growth, rather their usefulness and investments realized. A similar comment was done by Ayadi (2013) who arguing that the most important is how resources are used and how they are allocated to finance projects.

Including the domestic credit provided by financial sector instead of domestic credit to private sector provides the same results. Indeed, a negative relationship exists among both variables meaning that the increase level of credits was not the right determinant to boost the economic growth. But, this is not surprising to observe the negative relationship. Especially, if deposits are mostly used to finance domestic credit. Even if, Rwanda has increased the level of the domestic credit, data shown a relatively small amount, among 10-12% of the GDP at the end of 90's, compare to higher level observed in the neighboring countries. We can conclude that the level of credit was not enough high to provide a significant positive effect to boost the economic growth. Is solely

around 2012-2014, that the domestic credit increased to 17-20 % of GDP, whereas foreign countries allocated higher levels, almost the double.

Similar results are found in the Mediterranean countries between 1985 and 2009 (Ayadi, 2013). The author found that the credit to private sector and bank deposits have been negatively linked with growth, confirming deficiencies in credit allocation, a weak financial regulation and supervision. On the contrary, investments represented by the gross fixed capital formation have been positively linked to economic growth. Evidence was also found by Uneze (2013), arguing that whatever private or gross capital formation, a positive impact on economic growth was observed in sub-Saharan African countries. Thereby, higher and better allocated gross fixed capital formation has a significant effect on economic growth.

7. Summary and limits

Our two regressions provide similar results compare to previous studies, however, some information diverge a few. It could be due to different periods studied and variables selected. In each case, a significant and positive impact of liquid liabilities on economic growth was observed, in line with previous findings. On the contrary, financial system deposits, domestic credit to private sector and domestic credit provided by financial sector, have shown a negative impact on economic growth. Opposed to Okello (2015), who focused on more recent data than these selected in our study. Thus, comparing various periods do not provide the same results. These last years, Rwanda significantly increased his domestic credit. In that way, it has boosted the economic activity by focusing on more efficient investment projects, than during the 90's.

Gross fixed capital formation significantly contributed to improve economic growth and same results was found by Cyuzuzo (2018). The increasing competition and efficiency among banks, expressed by the net interest margin, has positively contributed to economic growth. Higher bank stability, expressed by Z-score, has improved the economic development. Finally, moderate inflation has also positively contributed the economic growth.

Given the short period of our observations, especially, due to weak availability of the financial data, it could be interesting to make a similar analysis, based on quarterly data, using alternative econometric models, in order to have a more robust analysis, and eventually, include some financial market data.

Conclusion

This project has provided evidence of the potential link between financial sector and economic growth, observed in Rwanda post-genocide period. Last decade, a huge interest accompanied by a wave of investments occurred in the financial sector to modernize the country and to improve international attractiveness.

Efficient development of the financial sector to promote economic growth has been broadly supported by facts on developed and developing countries. So, depending on the theory followed, supply-leading (financial development that leads to economic growth), demand-following (financial development that follows the economic growth) or bi-directionality, all agree about the importance of the financial sector on economic growth.

In Rwanda, researches mostly supported the supply-leading theory and the causal link to explain the direction.

Economic indicators have illustrated the country's growth, based on increase in gross domestic product, investments, trade in goods and services, but also controlled inflation and good public debt management. A decline of agriculture towards service sector and improvements done in business have contributed to a higher economic expansion.

Similarly, as observed in the financial sector, improvements in deposit financial institutions and non-bank financial institutions have expanded the access to population and have increased the services offered. Although, the Rwandan financial market is still at his early stage of development, it is gradually growing from to year.

Finally, the empirical analysis based on OLS model, provided additional facts on the impact of financial variables as stability, efficiency or depth on economic growth. Some variables have corroborated previous studies with their positive impact on economic growth, some on the contrary, have shown a negative impact. However, as mentioned, numerous studies mostly focused on recent period, included data since 2000. While few of them, analyzed a more distant period and included same financial indicators. Thereby, given constant improvements realized by the Rwandan government, the selected period can have a huge impact on our results. Why, there is important to keep in mind the time horizon in our analysis.

For further research, it would be interesting to conduct an in-depth study based on a larger sample and include some market data.

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